COLLEGE OF HEALTH SCIENCE
SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING

KNOWLEDGE, ATTITUDES, PRACTICES, AND FACTORS AFFECTING ARTIFICIAL INTELLIGENCE PRACTICES AMONG FINAL-YEAR UNDERGRADUATE HEALTH SCIENCE STUDENTS AT ADDIS ABABA UNIVERSITY, ETHIOPIA, (CROSS-SECTIONAL STUDY DESIGN),2025.

BY BIKILA BEKELE (MPH, MSc in EMCCN candidate)

A RESEARCH THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING.

JUNE, 2025

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A RESEARCH THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING.

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CERTIFICATION SHEET

As thesis research advisor, I hereby certify that I have read and evaluated this thesis prepared under my guidance Bikila Bekele (MPH) **"**knowledge, attitudes, practices and factors affecting artificial intelligence practices among final-year undergraduate health science students at Addis Ababa university, Ethiopia, 2025" I recommend that it be submitted as fulfilling the thesis requirement of masters of emergency and critical care nursing.

Dr. Lemlem Beza (postdoctoral researcher) _____ _____

Name of Main Advisor Signature Date

Mrs. Heyria Hussein (PhD candidate) _____ _____

Name of Co-advisor Signature Date

As members of the emergency and critical care thesis open defense examination, we certify that we have read and evaluated the thesis prepared by Bikila Bekele and examined the candidate. We recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of master of emergency and critical care nursing.

_____ _____ _____

Chairperson Signature Date

_____ _____ _____

Internal examiner Signature Date

_____ _____ _____

External examiner Signature Date

ADDIS ABABA UNIVERSITY

SCHOOL OF NURSING AND MIDWIFERY

COLLEGE OF HEALTH SCIENCE AND DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING

THESIS APPROVAL SHEET

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3. Examiner 1

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5. Department Head

_____Signature _____ Date _____

6. College Dean

_____Signature _____ Date _____

7. Director/Coordinator of the School of Graduate Studies

_____Signature _____ Date _____

ASSURANCE OF PRINCIPAL INVESTIGATOR

I declare that this research thesis entitled “knowledge, attitudes, practices, and factors affecting artificial intelligence practices among final-year undergraduate health science students at Addis Ababa University, Ethiopia, 2025 “it’s my work that was not addressed in the study areas as far as my knowledge touched and all the sources I use had indicated and acknowledged as a complete reference.

Name of investigators' signatures	Date	
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Name of adviser

1, ---	---	---
2, ---	---	---

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First and foremost, I would like to thank Addis Ababa University, college of health science, school of nursing and midwifery, department of emergency medicine, and critical care nursing for giving me the chance to conduct this study. Next, I would especially want to thank my advisors, Dr**.** Lemlem Beza (post-doctoral researcher) and Heyria Hussein (PhD candidate) for their guidance, support, and encouragement, unreserved precious comments and frank criticism from the beginning of title selection to thesis result interpretation. Additionally, I would like my special thanks to the participants of this study, data collectors, supervisors, and all individual participants involved in our study. Finally, my gratitude goes to my family, colleagues and above all the almighty God.

LIST OF ABBREVIATIONS AND ACRONYMS

AA	Addis Ababa
AAU	Addis Ababa University
AAUE	Addis Ababa University, Ethiopia
AI	Artificial Intelligence
AOR	Adjusted Odd Ratio
CHS	College Of Health Sciences
COR	Crude Odd Ratio
HCP	Healthcare Professional
ML	Machine Learning
MRI	Magnetic Resonance Imaging
SPHMMC	Saint Paul's Hospital Millennium Medical Colleges
SPSS	Statistical Package For Social Sciences
VIF	Variance Inflation Factor

ABSTRACT

Background: Artificial Intelligence (AI) was the rapidly advancing tools that involve the development of health systems to perform tasks that typically require human intelligence, such as problem-solving, decision-making, and language processing. However, there was limited research data about it. Therefore, this study aims to bridge that gap by evaluating the level and identifying factors influencing artificial intelligence use among health science students, understand, views, and applies to make sure that they are prepared to join the benefits of this developing technology.

Objective: To assess the level of knowledge, attitudes, practices, and factors affecting artificial intelligence practical usage among final-year undergraduate health science students at Addis Ababa University, Ethiopia, 2025.

Method: An institutional-based cross-sectional study design was employed. Selected by census sampling method. Data was collected by self-administered structured questionnaires on the Kobo toolbox. Frequencies and proportions are summarized by descriptive statistics. Cronbach's alpha (K-0.839, A-0.845, P-0.801.) and Chi-square tests were conducted, the Hosmer-Lemeshow test cheeked, and multi-collinearity by variance inflation factor <4.5. Simple and multiple binary logistic regressions assessing the association between independents and outcome variables.

Result: Out of 421 participants the mean age was 24.33 ± 1.864 years, with a respondent rate of 96.9%, single 393(96.3%), information internet/social media 334(81.9%) lowest group midwifery departments (10). More than half had inadequate knowledge 294(72.1%), However, favorable attitudes 235(57.6%) and insufficient practices 300(73.5%), nursing students (AOR 0.388, 95%(.170-.885, p-.024)) associated with attitudes and lack of knowledge (AOR_1.905, 95% [1.173–3.09], p_.009) and limited access to technical equipment (AOR_1.739, 95% [1.066–2.837], p_.027) had association to practices.

Conclusion: Due to a lack of formal training, most students had inadequate knowledge and practical skills. Nursing students show a significant association between attitude and technology, while limited knowledge and equipment accessibility affect practice. Barriers hinder adoption, underscoring the need for curriculum integration and strategic awareness campaigns. Further research was needed to address adoption challenges and overcome implementation obstacles.

Keywords: artificial intelligence, knowledge, attitude, practice, factor affecting, Ethiopia

1 INTRODUCTION

1.1 Background

Artificial intelligence (AI) refers to the competency of a machine to perform intelligent human behavior, including learning, reasoning, problem-solving, and natural language understanding, with application in healthcare and it's the simulation of human intelligence processes by machines, particularly computer systems[1]. Therefore, Artificial intelligence (AI) is a revolutionary technology and a sub-field of computer science which is the creation of intelligent machines and software that work and act as human beings[2].

It is a branch of computer science and the key features that allow us to define AI is a system to learn**,** adapt**,** perceive**,** and make decisions in a wide range of applications, from healthcare entertainment to robotics[3]. Furthermore**,** there are some subtypes of AI such as machine learning, deep learning, neural networks, fuzzy logic, evolutionary computing, and hybrid artificial intelligence used in different sectors including health sector [1, 2, 4, 5].

Artificial intelligence (AI) is the transforming field of data science and information technology through the application of advanced systematization technologies to improve task performance and optimize chains of operations to succeed health sector[6,7]. As a result, these technologies master problem-solving and adaptive learning across systems, applying AI to autonomously improve with the help of data, neural networks, and natural language processing[8], It was very important in learning and teaching systems at medical education[9].

Artificial intelligence (AI) has validated its potential in the medical industry by being able to classify medical images that physicians use in machine learning applications like skin lesion images for detecting conditions like melanoma, pathology slides for detecting diseases, radiology images (x-rays), computed tomography scans (CT-scans), and magnetic resonance imaging(MRI**)**[10,11].The study reveals that healthcare professionals (HCP) have varying perceptions and preparedness for the integration of AI technology into health sciences [4].

A study conducted in Pakistan among doctors and students revealed that 69% of students had basic knowledge of AI and 76.7% supported its inclusion in the curriculum[12]. As this study result shows of the respondents aware of radiology 52%[13]. However, AI is now a day started to utilized in radiology and increased awareness of its positive impact can increase familiarity and enhance

workflow efficiency [6]. In addition to this, the public awareness and understanding of AI was important to Ethiopian health systems. Since, its understanding and awareness are used to ensure AI is effective safely and responsible for healthcare delivery [14].

Even though there is a positive perception of AI, other research was conducted in Africa and revealed a huge knowledge gap which stresses the importance of providing specific educational initiatives to increase people's knowledge and contact with AI, particularly in the field of health sciences[15]. Therefore, the purpose of this study was to determine the level of knowledge, attitudes, practices, and factors affecting AI practices among final-year undergraduate health science students at Addis Ababa University, Ethiopia.

1.2 Statement of the Problem

The global healthcare system has been gradually paying attention more to the utilization of modern technologies, primarily artificial intelligence, to make sure that the quality and effectiveness of the care of patients improve[16,17] . A study done in India shows, that establishing guidelines and standards for AI in the healthcare system was crucial to enhancing good patient outcomes, optimizing cost management, and expanding access to services[18]. Therefore, AI was most commonly used in such types of care to increase the accuracy of diagnostic tests (86.5%), identify drug interactions (82.75%), and analyze medical tests and imaging (80%) [19,20]. However, other studies conducted in Northern Saudi Arabia show low KAP with 55.7%,37.0%, and 50.3% of health science students toward AI[21].

Very small which was 11.3% of professionals participants had practical uses of AI in the medical field for diagnostic scans and research purposes particularly radiology (X-ray, CT, and MRI) and pathology (Histo-pathological tests) [22]. Out of 368 medical students 167(75.4%) had no prior exposure to AI in medicine[23]. In addition to this, a very small number of respondents 7% mentioned data collection and evaluation, 6% new treatments, and 6% research as AI uses[24]. AI helps HCPs in multiple ways particularly, clinical decision-making, hospital operation, medical image analysis, patient monitoring, and transforming patient care[25]**.**

A contents analysis of social media data in China revealed that negative public attitudes toward medical AI are often based on a lack of trust in AI and the absence of a humanistic care factor [26]. In addition to this, most medical students lack a comprehensive understanding of the impact and implications of AI in the field of medical sciences[12]. Out of 631 (73%) students aware of AI,

227(26.5%) are still not aware. However, a large number of students 84% did not receive formal education on AI in their field of interest[9].

Healthcare professionals (HCPs) do not understand well about AI technology utilization in healthcare settings. But, have negative as well as positive outlooks towards AI and some of them see it as a potential effect. Whereas, others of them fear job loss and its compromise on care quality. In addition to this notices a gap in practical AI exposure, stressing the need for better AI education in health curricula[27].

A study conducted in Riyadh states that a lack of awareness about how to choose technology that provides value and integrates into patient care packages, and a lack of knowledge among healthcare workers regarding AI and machine learning (ML) may result in worse patient outcomes[28]. Even with, the growing of different types of AI tools in healthcare, there is limited understanding of healthcare students' awareness and perception of AI. Therefore, this knowledge gap compromises effective familiarity and utilization of AI in future-generation practices16].

Lack of curriculum in healthcare programs leads to a significant factor in attitudes towards AI ($p < 0.05$) [22]. Healthcare students did not have adequate awareness and understanding of AI, which caused a limited ability to integrate AI into clinical practice. Overall, this inconsistent inclusion of AI in the curriculum and also, limited practical experiences make unsatisfactory students' preparedness to confidently use AI tools in a healthcare setting[28,29].

As of African country Ethiopia was a developing country that encountered challenges, either directly or indirectly, due to the consequences of AI interruption, particularly its socioeconomic status compared to nations adopting AI[32]. Artificial intelligence (AI) education curriculum added to medical courses can address the gap present since it increases willingness to adapt and awareness towards AI in application in recent medicine[22].

Artificial intelligence (AI) was incorporated into medical school curricula, as 174(78.7%) students believed that every medical professional should receive training[23]. Moreover, providing face-to-face instruction, and manual training, are important ways to implement and realize AI technology effects[31]. For that reason, the ultimate aim of this study was to determine the gap by assessing the knowledge, attitudes, practices, and factors affecting AI practical usage among final-year undergraduate health science students at Addis Ababa University, Ethiopia.

1.3 Significance of the Study

The global healthcare systems was rapidly integrating AI in areas such as diagnostics, treatment planning, and patient management to improve patient care[12]. The presence of knowledge, attitudes, and practical experience with AI would significantly shape the successful incorporation of AI into the healthcare system[21,33]. For this reason, the successful integration of AI into the healthcare sector largely depends on the willingness and engagement of healthcare professionals with these emerging technologies. Accordingly, to future healthcare providers, medical students are expected to play a significant role in promoting AI advancements and clinical applications in the utilization of AI.

In advance, insight into the practical usage of AI would clarify how AI tools w being incorporated into clinical decision-making and patient care by the design of targeted training programs[34], improve AI-related curricula, and ensure that students are prepared to apply AI's potential. But, had equipped to address the ethical challenges that may arise[35]. In this way, the Ethiopian healthcare system can maximize the transformative potential of AI in healthcare by effectively preparing medical students which leads to improved clinical outcomes, enhanced efficiency, and better patient care. For this intention, this study contributed to assessing the gap and then recommends to the concerned body to enhance the quality of Ethiopian health science students.

A study conducted in Jordan 2023, and Saud Arabian 2024, identifies gaps and informs educational strategies to improve AI integration into healthcare, ultimately enhancing patient care in resource-limited settings[12,32]. In addition to this, identifying any concerns or barriers that may delay its successful implementation and adoption of AI, in clinical settings[21]. Similarly, this study would identify the existing knowledge gaps, and why they were not well prepared to integrate AI into medical education and clinical practices. In general, this study would provide insights into the knowledge, attitudes, and practice level of the final years of undergraduate health science students at AAU in Ethiopia regarding AI.

2 LITERATURE REVIEW

2.1 Overviews of literature

In 2017, a study undertaken at Stanford University showed that AI supports human doctors in diagnosing skin cancer through the realization of more than 90% diagnostic accuracy[37]. There are various perceptions about the role of AI, some perceive it positively, while others raise ethical concerns that are important to understand to facilitate AI adoption in medical education[9]. However, there is a positive correlation between knowledge and attitude ($p = 0.001$), knowledge and practice ($p = 0.001$), and attitude and practice ($p = 0.001$) respectively[21].

Healthcare professionals in radiology show less exposure to AI with inadequate knowledge and acceptance of radiology[6]. Similarly, as student results reported from Mogadishu 67.6% of healthcare professionals had good knowledge about AI. While 80.5% had a good attitude towards its potential use in healthcare, 79.1% demonstrated poor application of AI [33].

2.2 Socio-demographic characteristics

Artificial intelligence (AI) is more interested in older adults, males, and high standard of living person[26]. Out of 157 pharmacy students, 73.9% knew about AI, and 109 (69.4%) students understood that AI was a tool assisting HCP. As well, the majority 57.3%, of the students were aware that AI would be assisting HCPs. In addition, 75.1% of students agreed that AI reduces errors in medical practice[28]. Gender had little influence on the level of preparation for AI. However, regular monitoring among students was required to establish other demographic characteristics that affect the perception of AI[9]**,** other study shows females had significantly better attitudes and practices towards AI than males[21]**.**

Mean positive perception score varies significantly with age, and year of study, thus further underlining differences in attitudes[4], However, gender had no significant effect on attitudes[22] As long as, the mean positive perception score of participants also did not correlate significantly with gender(p_.916) [28], (p _.289)[38]. However, the main source of information was the Internet (65.8%)[38], and radiology(96.50%) department participants were familiar with AI[39]. In addition to this, the predominant source of information about AI was Internet sources 171(58.9%)[40]. Less than, 10% of students received some teaching course on AI, and most of the healthcare students gained their knowledge regarding AI through mass media.[35]**.**

2.3 Knowledge of Artificial Intelligence

Of nursing students who are self-taught 38.6%, and who do not know 33.6% about AI, 68.2 % of nursing students know AI[41]. In terms of educational background, 39.1% of nurses reported that the basics of AI were covered in their undergraduate education, while the majority (60.9%) stated otherwise [42]. Over half knew AI applications by unconfirmed reports, while 20% had detailed knowledge[24], 71.9% of participants understood the term AI[23], and most radiology and pathology images were scanned at the same time by machine[43].

The study revealed that 98% of respondents were aware of AI in library operations, whereas, 2% of respondents reported being unaware of the AI technologies[44]. In addition to this, training in dental schools and education will be necessary to raise AI awareness and allow the full potential of AI in dentistry to be realized[34]. As a study done in Lebanon shows, the participants 43% revealed a high level of knowledge of AI[45]. The mean knowledge score of AI is 42.3 ± 21.8 out of 100 students[46].

2.4 Attitude towards Artificial Intelligence

According to the study results, there was a positive relationship between AI awareness and occupation exhaustion in a medical setting[47]. The recent tools cannot justify healthcare professionals' interest in preparedness, or their ideas about its influence on their professional role[48]. Also, 37% of Americans had a positive attitude toward AI usage among the public[49]. A review study indicates that health science students had a positive attitude toward medical AI[31]**.** In addition to this, AI could detect pathologies in radiologic examination (83%) but not definite diagnosis (56%) and revolutionize and improve radiology (77% and 86%), whereas, disagree with ideas support that human radiologists had replaced (83%)[13].

A 2022 study revealed that about 70% of medical students and 81.8% of doctors believed that AI tools could be used as healthcare professionals shortly[12]. Trust-building between individuals, groups, or organizations was vital for the effective integration of AI into healthcare training[18]. Also, the study found that Saudi Arabian medical students intended to hold a positive perception towards AI and had positive attitudes regarding AI in ophthalmology[50]. In addition to this, medical student's perception and opinion regarding AI for reducing medical errors 95.8%[51], and 67.3% of students had a positive attitude toward AI [41].

2.5 Practices of Artificial Intelligence

Artificial intelligence readiness levels do not significantly differ in various medical schools in Jordan. Notably, the greatest number of students (84%) do not receive a formal education about AI from their schools. Besides, the higher academic performance and previous exposure to AI and the higher AI readiness level significantly[9]. But, AI tools play a significant role in various medical practices (56.4 %)[52], reducing medical error (95.8%)[51].

Another important point was that soft skills like empathy and emotional intelligence becoming crucial for professionals working with AI and information, which is crucial for professional personnel to rethink the way it integrates and influences emerging AI technologies to data analysis and automation effect[53]. However, the maximum number of respondents (92.6%) had information about AI technology in their practices. While a small number (39.5%)had a good understanding of its concepts of AI application[46].

2.6 Factors affecting AI integration into medical education

2.6.1 Personal Factors

The barriers affecting the use of AI in healthcare are lack of knowledge, access, and curriculum gaps[27,22]. Consequently, educational gaps/ instructional gap in knowledge and skill of AI (96.2%)[51], different types of AI including contributions to medical research software (49%)[52]. In addition to this, medical students who got formal training on AI significantly had adequate knowledge (p_.001)[21]. Additionally, other study review shows that healthcare students had positive toward AI in medicine. However, had low knowledge and inadequate skills in working with AI technology[31].

This global study finding shows that some countries such as Germany, Finland, Netherlands, Estonia, Israel, Japan, South Korea, and China had good trust in healthcare AI or general AI except human resource AI[50]**.** As the study shows, the participant's view towards affect trust in AI (45.5%)**.** Lack of trust are important reason why some people still have negative attitudes toward medical AI[26]. Therefore, there was a strong association between trust in AI and acceptance of AI ($p<0.001$)[50]. As a study done in Europe shows, male and teachers respondents were more confident to benefit from AI and less fearful of AI technologies [13], with fear of the unknown at 3.6% affecting AI technology[54].The key influencing factors of AI trust in medical and clinician

machine teaming during critical decision-making such as explain-ability, transparency, interpretability, usability, and education [55].

Only 8.3% of respondents identified ethical issues of AI in healthcare, and only 7.6% were aware of AI ethics frameworks; these showed that much more emphasis had to be directed to ethics during the education of AI[40], training to solve ethical problems related to AI (93.8%)[51]. Additionally, In the healthcare system transforming with AI technology ethical considerations are essential by considering patient privacy, autonomy, and data security as well as transparency, accountability, and fairness during the implication of AI important point[56]. Additionally, there are different challenges regarding AI use among health science students such as ethical, legal[57], and social domains, necessitating cautious consideration and strategic solutions to make sure that the benefits of AI are recognized without compromising patient welfare, data integrity, or ethical standards[5].

2.6.2 Institutional Factors

Study shows that more than two-thirds of participants agreed on the importance of AI being included in medical training/curriculum (71%)[13]. As other studies state, a factor affecting knowledge of AI was the lack of a formally recognized curriculum[30]**.** Therefore**,** the lack of curriculum developments affects AI learning by 8.20% [54]. Therefore, important to incorporate AI curriculum into medical courses[21]. Only (18.6%) of respondents received education or training in AI technology[46, 58]. A study result shows, that out of 825 total, 535 (64.8%) medical doctors, consider special training for using AI important[25].

2.6.3 External Factors

The compatibility of AI with existing healthcare systems, and the unavailability of sufficient data for training were risk factors for the adoption of AI. This shows as, important to inform education policymakers and health system strategies to update curricula with AI content[56]. Students who were more exposed to AI technology had higher levels of AI readiness and ensured perfect AI incorporation into medical practices. In addition to this, Policymakers and medical instructors adjusted the system to deliver AI courses [52], lack of funding was cause 6.8% delayed from AI technology[54]. Other study results show that medical and dental professionals were not ready for AI[59]. As other study result shows, medical students' readiness for AI was 70.59 %, with maximum AI readiness of females 71.84% higher than males 69.62%. But, this difference was statistically not significant ($p = 0.106$)[60].

In general, majorly to integrate AI into health education and health practices there were different challenges including data privacy, security, ethical and legal considerations, and inaccessibility of resources, lack of knowledge, lack of AI trust, limitation of curriculum. Therefore, important to address challenges by delivering training[31], and integrating curriculum into medical education[5].

2.7 Conceptual framework

This conceptual framework figure shows, the presence of an association between socio-demographic characteristics and knowledge, attitudes, and practices of AI. In addition to this, It seeks to determine the presence of background features, exposure, and challenges experienced by different factors affecting AI practices. It's developed from this listed different literature which was conducted in different countries prior such as. Also, personal factors, external factors, and institutional factors this factor obtained from those references [5, 27, 36, 57, 61].

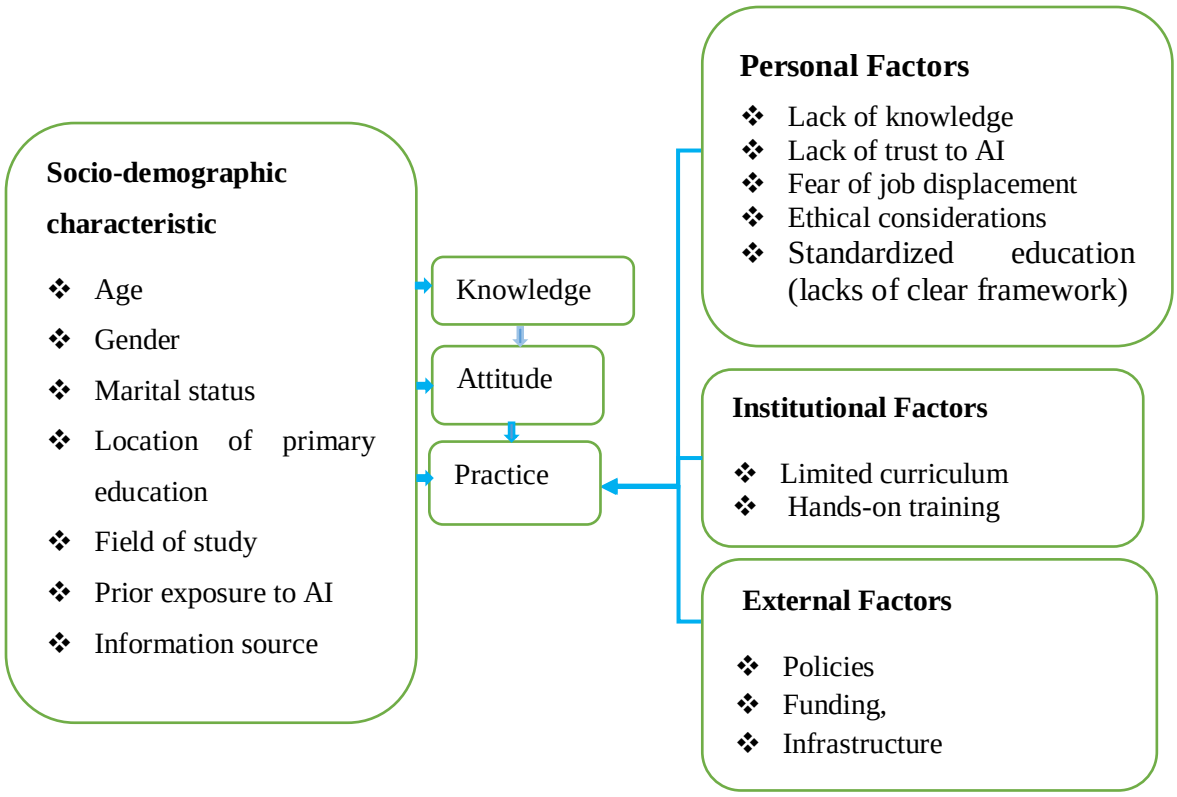

Figure 2.1 conceptual framework of knowledge, attitudes, practices and factor affecting practical usage of AI among final-year health science students at AAUE, 2025.

3 OBJECTIVE OF STUDY

3.1 General objective

- The study aims to assess knowledge, attitudes, practices, and factors affecting the practical usage of AI among final-year health science students at Addis Ababa University, Ethiopia.

3.2 Specific objectives

- To assess the level of knowledge of AI among final-year undergraduate healthcare students at Addis Ababa University, Ethiopia, 2025.
- To determine attitudes towards AI among final-year undergraduate healthcare students at Addis Ababa University, Ethiopia, 2025.
- To evaluate practical utilization of AI among final-year undergraduate healthcare students at Addis Ababa University, Ethiopia, 2025.
- To identify factors affecting AI practical usage among final-year undergraduate health science students at Addis Ababa University, Ethiopia, 2025.

4 METHODS AND MATERIALS

4.1 Study area and period

A study was conducted at Addis Ababa University (AAU), Ethiopia. It assesses the level of knowledge, attitudes, and practices regarding artificial intelligence and factors affecting its usage among final-year undergraduate health science students. AAU was the most prominent national university which was located in Addis Ababa, Ethiopia. AAU has 14 campuses in general and from that college of Health Sciences has seven undergraduate programs such as medicine, nursing, laboratory, pharmacy, radiology, anesthesia, and midwife at the first-degree level. In addition to this, AAU College of Health Sciences has postgraduate degrees and PhD programs. The total number of health science students at AAU was 4360 among this number of undergraduate health science students in was 1935 program actively 421 were total final-year undergraduate health science students during our study period.

Addis Ababa University goals to 2030 was become the leading center of AI across Africa country building a vibrant environment of modernization, research, and technology development. Therefore, Plan to support interdisciplinary knowledge, transformation ethical and connect academic research with industry to drive digital transformation technology. In collaboration with institutions like Ethiopian AI Institute, the university struggles to produce impactful, locally driven technologies that advance nationwide progress and develop global attractiveness.

In this institution, undergraduate health science students would be expected to have advanced knowledge, attitudes, and practices on different technology and medical education programs collaterally when compared with another university. Since its main university which shaped and used as an example of other Universities in Ethiopia for this reason AAU was selected specifically as the study area and undergraduate health science students as the study population. However, this study was done from March/14/ to April/28, 2025.

4.2 Study design

An institutional-based cross-sectional study was employed.

4.3 Source of population

All undergraduate health science students across all departments were currently on training or

engagements at Addis Ababa University, Ethiopia, 2025. G.C.

4.4 Study population

All final-year undergraduate health science students who were actively involved in first-degree programs during the study period at the College of Health Sciences in Addis Ababa University, Ethiopia, 2025. G.C.

4.5 Study unit

Each individual final-year undergraduate health science student who had agreed to consent to this study at the College of Health Sciences in Addis Ababa University, Ethiopia, 2025. G.C.

4.6 Inclusion and exclusion criteria

4.6.1 Inclusion criteria

All final-year undergraduate health sciences students were willing to give informed consent and engaged at the time of data collection.

4.6.2 Exclusion criteria

Students, who were not final year of the study program, did not agree to fill and who were seriously ill during the data collection period would be excluded from the study.

4.7 Sample size determination

Sample size determination was calculated using single population proportion formulas. However, still, now no similar study has been conducted on this title in Ethiopia even in Africa with the same study population. However, by taking a similar study conducted in other African countries with a comparable context. It was suggested to grounding this study on data from a study conducted in Somalia, which had the rates of knowledge, attitude, and practice at 67.6%, 80.5%, and 79.1%, respectively [33].

This approach provided a statistically valid method for determining the required sample size, with a margin of error of 0.05 and a confidence interval of 95%. The formula used to calculate the initial sample size (n) was:

$$n=\frac{(z\,{}^{a}/_{2})^{2}p(1-p)}{d^{2}}$$

n - was calculated sample size

z = Confidence interval 95% (1.96)

p = the estimated proportion (knowledge = 0.676, attitude = 0.805, and practice =0.791)

d^2 = marginal of error (5%)

n $\frac{3.8416 \times 0.676(1-0.676)}{0.0025} = \frac{0.841}{0.0025}$ knowledge n≈ 336, attitude n≈ 241, and practice n≈ 254.

In this study, the total sample size was calculated based on a large proportion variable which was knowledge 336, then after adding 10%(33.6) total sample size became 370 health science students involved. However, our target population was 421 in number which was feasible and manageable for this reason the total final sample size was 421 included in the study.

4.8 Sampling technique and procedure

Initially, Addis Ababa University College of Health Science was purposively selected. So, AAU College of Health Science has seven different programs study for undergraduate health sciences students such as medicine (236), laboratory (25), nursing (30), anesthesia (20), pharmacy (72), midwife (10), and radiology (28) was selected to ensuring representative and accuracy of this study. Therefore, the total number of students was 421 which was feasible. For this reason, a census sampling method was applied to include all eligible / excluding all ineligible participants from the selected departments.

4.9 Study variables

4.9.1 Dependent variable

Knowledge, attitude, and practice toward AI

4.9.2 Independent variable

Socio-demographic characteristics, such as age, gender, marital status, location of primary education, field of study, and prior exposure, and other factors affecting AI usage include, AI trust, lack of knowledge, fear of job displacement, and ethical considerations, limited curriculum integration and insufficient hands-on training also contribute to barriers. Additionally, healthcare system readiness, including policies, funding, and infrastructure, plays a vital role in AI

applications.

4.10 Operational definition

Knowledge of AI: The concept and understanding of AI in medical education by using 10 questions, for each correct response assigned 1 point from the total score ranged from 0 to 10 for statistical analysis based on cut-off point adequate knowledge mean score > 60% of total items (≥6 out of 10) and inadequate knowledge score ≤ 60% of total items [33,61].

Attitude towards AI: The perception, beliefs, willingness, and views on the usefulness, and ethical consideration of AI in health sciences were measured, and the total attitude score ranged from 0 to 10 questions. For statistical analysis using Likert-scale questions (scored 1-5) neutral, disagree, strongly disagree, agree or strongly agree, and the level of attitudes classified based on cut-off point positive attitude mean score ≥3.5, negative attitude mean score < 3.5 [22,33].

Practice towards AI: The use of AI tools and technologies in patient care, decision-making, and other clinical activities within healthcare systems. It assesses the frequency and extent of AI use by asking structured self-reported using total practice scores ranging from 0 to 8 questions for statistical analysis coded yes to 1, no to 0 response. Therefore, the practice level of participant responses was categorized based on the cut-off point adequate practice got more than the mean score of 5 out of 8 (> 62.5%), and inadequate practice < 5 or (≤ 62,5%) out of 8[33,27].

Personal factors: The factor that faces any person to use AI, are lack of AI knowledge, trust in AI, fear of job displacement, ethical concerns, and lack of standardized education (lacks of clear framework) on the person.

Institutional factors: A factor hinders AI use in health sciences education settings, including curriculum limitation, and hands-on training.

External factors: A barrier faced due to external problems among individual students which includes healthcare system readiness (policy support, funding availability, and infrastructure) for implementation of AI.

Practical use of AI: means the practical application of AI tools, systems, or technologies in academic settings among undergraduate health sciences students.

4.11 Data collection tool and procedure

The data collection would be primarily prepared by structured, closed-ended questionnaire, collected by the Kobo toolbox which had been developed to assess the knowledge, attitude, practice, and factors affecting AI use among undergraduate final-year health science students at AAU. The survey tool used in this study to gather relevant data would be adapted from earlier studies in different countries on a related topic.

The questionnaire contained five main parts. The first section contains socio-demographic characteristics, the second part emphasizes knowledge characteristics, the third section addresses attitudes by Likert-scale forms consist attitude aspects (strongly agree to strongly disagree), and fourth section consisted of practices level question the fifth section consists of factors affecting AI use among undergraduate health sciences students were assessed by multiple choice questionnaire forms.

For the data collection process, census sampling techniques were employed to encompass all eligible participants from undergraduate healthcare students. To ensure comprehensive knowledge, about this study the students were informed about the study through a variety of communication channels and by the principal investigator as well as data collector of the study.

The study aims to guarantee that all eligible students are fully informed and provided the opportunity to engage in the study. The data collector was well informed about data quality control, governance, research methods, the study's purpose, confidentiality, data collection timing, and submission procedures after filling out the Kobo Toolbox-created survey data. The principal investigator crates the survey questionnaire first and then checks all survey was data filled. After that, the survey data through a web link of Kobo Toolbox to participants on Telegram students got link-filled responses and then finally clicked on submission. The questionnaire tool was prepared in English. However, the data collection process would take six weeks to get from different departments.

4.12 Data Quality Assurance

A pretest was done on 32(10%) of 421 health science students at St. Paul's Hospital Millennium Medical College to ensure internal consistency and reliability of the tools. To keep the reliability of the questionnaires, particularly for Likert-scale items Cronbach's Alpha (knowledge =0.839,

attitude = 0.845**,** practice = 0.801).

After collecting the pretest data, each questionnaire response was checked for any potential problem relating to the instrument, such as any difficult question that did not satisfy the respondent's psychology, or not understandable or unclear questions for corrective measures like make clear, and avoid understandable questions. Both data collectors and supervisors were trained on the objective of the study and techniques of data collection as well on methods of data Kobo toolbox web link form for submission. The principal investigator checked the completeness and consistencies of questionnaires before data entry to verify the completeness and accuracy of the collected data.

4.13 Data Processing and Analysis

The completed questionnaires were reviewed for completeness and consistency. The principal investigator exported into SPSS version 25 for further exploration by excel form. Descriptive statistics would be employed to calculate frequencies, means, and standard deviations to summarize and describe the data.

Regression analysis was used to examine associations between various demographic or professional characteristics such as knowledge, attitude, and practice regarding artificial intelligence. The ways of analysis would have been coded again after collected data and descriptive statics would have been done after categorizing the dependent variable into dichotomous.

Simple and multiple binary logistic regression analyses would be applied to identify factors related to knowledge, attitude, and practice levels. The variables with significant associations (p-value $\leq$ 0.25) in the bivariate analysis were taken into the multiple binary logistic regressions to identify independent relationship presences. In addition to this, the backward Wald method (stepwise) in logistic regression to remove unimportant variables was applied under multiple regression analysis. Therefore, the effects of potential confounders were controlled under multiple regression analysis. A statistically significant association was considered with a p-value of less than 0.05. adjusted odds ratios were reported alongside their 95% confidence intervals (CI) to observe associations between variables.

The chi-square test examines the association between categorical variables and correlation analysis was checked by using Pearson correlation coefficients with $|r| < 0.7$ value. The final model fitness

confirmed its appropriateness using the Hosmer Lemeshow test (p-value was greater than 0.05). Multi-collinearity was checked by a variance inflation factor (VIF < 4.5) throughout the data.

Finally, logistic regression analyses with the backward Wald method (stepwise method) to find the factors linked with knowledge, attitudes, and practice. Accordingly, the dependent variable results were categorized into two groups adequate and inadequate for knowledge and practices as well as negative and positive for attitudes to be used as a binary outcome. So, the variable with a P-value below 0.05 was considered statistically significant.

4.14 Ethical Consideration

Ethical clearance was obtained from the ethical committee of the department of emergency medicine and critical care nursing, college of health science, Addis Ababa University. Approval to conduct the study was obtained from each department of our study area and the study was conducted based on voluntary participation by study subjects after explaining the purpose of the study on a telegram platform with web links to questionnaires. All the information accessed from study participants would be kept confidential. As a result, participants were read written informed consent, and names were not recorded on the survey questionnaires.

4.15 Dissemination of the findings

The findings of the study would have been presented to Addis Ababa University and copies submitted to post-graduate offices, libraries, and departments of emergency medicine and critical care nursing. The findings of this study were communicated to all stakeholders through reports, conferences workshops, and research forums. Finally, efforts would be made to publish in well-known international journals to communicate with the scientific community.

5 RESULT

5.1 Socio-Demographic Characteristics of Respondents

Out of 421 study participants, 408 responded to the study, with a 96.91% response rate. The majority were female 223 (54.7%)**,** with the minimum age reported was 19 (0.5%). The sources of information about AI were mainly from the internet/social media 334(81.9%), attended elementary and high school in urban areas 310(76.4%) and the lowest participant departments was midwifery students10**(**2.45%**)** reported. (Table 5.1).

Table.5.1 Socio-demographic characteristics among undergraduate final-year health science students (n=408) in AAUE, 2025.

Variable	**Response**		**Frequency, (N=408)**	**Percentage (%)**
Age	18-20		4.0	1.00
	21-23		121	29.7
	24-26		237	58.1
	≥27		46	11.3
Gender	female		223	54.7
	male		185	45.3
Location	rural		98	24.0
	urban		310	76.0
Departments	medicine		229	56.1
	nursing		27	6.60
	pharmacy		70	17.2
	laboratory		25	6.10
	anesthesia		20	4.90
	midwife		10	2.50
	radiology		27	6.60
Marital	Single		393	96.3
	Married		15	3.7
Prior exposure (experiences)	Clinical	yes	189	46.3
		no	219	53.7
	Academic	yes	160	39.2
		no	248	60.8
	Other*	yes	104	25.5
		no	304	74.5
	No exposure	yes	16	3.90
		no	392	96.1
Information	Curriculum	yes	46	11.3
		no	362	88.7
	Internet	yes	334	81.9
		no	74	18.9
	Others **	yes	8	2.0
		no	400	98.0

Variable	Response		Frequency, (N=408)	Percentage (%)
	No source	yes	50	12.3
		no	358	87.7

Others ** = (colleagues/friends & sminar)

Information = Sources from where get concepts about AI

5.2 Description of knowledge, Attitude, and practice of AI

Knowledge: the participant's mean knowledge score was 6.07±1.71. Two hundred ninety-four (72.1%) participants have inadequate basic knowledge of AI**.** However, the majority 390 (95.6%) were aware of AI. Additionally, 295(72.3%) highlighted the need for better AI education. Whereas, most know deep learning/machine learning (subtypes of AI) 269(65.9%) and other specific responses revealed. (Table 5.2).

Table 5.2 Correct and incorrect responses to knowledge of AI among undergraduate final-year health science students (n = 408) AAUE, 2025.

	Yes (%)	No (%)
Do you know what artificial intelligence is?	390(95.6)	18(4.400)
Have you ever been taught about AI technology in your curriculum?	295(72.3)	113(27.7)
Do you understand barriers to the application of AI in health sciences?	280(68.6)	128(31.4)
Do you know about any application of AI in health science?	272(66.7)	136(33.3)
Do you agree with AI-assisted emergency responses?	264(64.7)	144(35.3)
Are you aware of any AI applications in radiology?	242(59.3)	166(40.70
Have you ever heard of AI applications for diagnosing diseases?	235(57.6)	173(42.4)
Are you aware of any AI applications in pathology?	200(49.0)	208(51.0)
Have you received training on AI technologies in your field of study?	161(39.5)	247(60.5)
Do you know about deep learning/machine learning (subtypes of AI)?	139(34.1)	269(65.9)

Attitudes: The participants' mean attitude score toward AI was 37.2 ± 5.380 with the total percentage of positive attitudes toward AI in medical education 235 (57.6%) of participants among undergraduate health sciences students. The specific response to attitudes was reported. (Table 5.3).

Table 5.3 Correct and incorrect responses towards attitudes of AI among undergraduate final-year health science students (n = 408) AAUE, 2025.

	SA (%)	A (%)	Ne (%)	DA (%)	SDA (%)
I believe the ethical consequences of AI will be understood by different students	108(26.3)	159(38.7)	79(19.2)	53(12.9)	12(2.9)
I believe AI is essential in the health science curriculum.	106(25.8)	150(36.5)	103(25.1)	41(10.0)	11(2.7)
I believe that AI revolutionizes the educational system.	91(22.1)	185(45.0)	66(16.1)	55(13.4)	14(3.4)
I think that health science students should receive training on the use of AI tools.	92(22.4)	161(39.2)	83(20.2)	43(10.5)	32(7.8)
I think AI aids practitioners in early diagnosis and assessing the severity of disease.	72(17.5)	178(43.3)	87(21.2)	60(14.6)	14(3.4)
I believe AI reduces the workload of healthcare students.	56(13.6)	197(47.9)	79(19.2)	56(13.6)	23(5.6)
I believe that clinical AI is more accurate than healthcare professionals.	41(10.0)	111(27.0)	123(29.9)	107(26.0)	29(7.1)
I think the benefits of AI compensate for risks in healthcare.	38(9.2)	134(32.4)	137(33.3)	78(19.0)	24(5.8)
I believe AI would increase the percentage of errors in diagnosis and care.	38(9.2)	107(26.0)	121(29.40)	113(27.5)	32(7.8)
I believe that in the future AI replace healthcare professionals.	38(9.2)	105(25.5)	122(29.7)	108(26.3)	38(9.2)

Strongly agree (SA), agree (A), neutral (N), disagree (D), strongly disagree (SDA)

Practices: The mean practice score was 5.04 ± 1.014**,** with 300 (73.5%) showing inadequate AI practice. This report indicates that undergraduate final-year health science students had strong AI adoption for study and plans with AI. Whereas, formal AI education through courses was relatively limited. (Table 5.4).

Table 5.4 Correct and incorrect responses to practice of AI among undergraduate final-year health science students (n = 408) AAUE, 2025.

	Yes (%)	No (%)
Have you frequently applied AI technology in your field of study?	352(86.3)	56(13.7)
Do you plan to work on AI in your future program?	331(81.1)	77(18.9)
Did AI use to make your task easy?	323(79.2)	85(20.8)
Was it easy for you to apply AI?	288(70.6)	120(29.4)
Has AI integrated into clinical practice during clinical attachments?	223(54.7)	185(45.3)

Have you ever used AI frequently to conduct your exams?	203(49.8)	205(50.2)
Do you plan to use AI regularly for conducting research?	196(48.0)	212(52.0)
Have you attended any previous online/offline courses regarding AI?	139(341)	269(65.9)

Knowledge, attitudes, and practice level: This graph illustrates AI knowledge, attitudes, and practice levels among 408 participants, showing 72.1% with inadequate knowledge. While,57.6% with positive attitudes, and 73.5% have inadequate practice, highlighting gaps in AI usage in medical education.

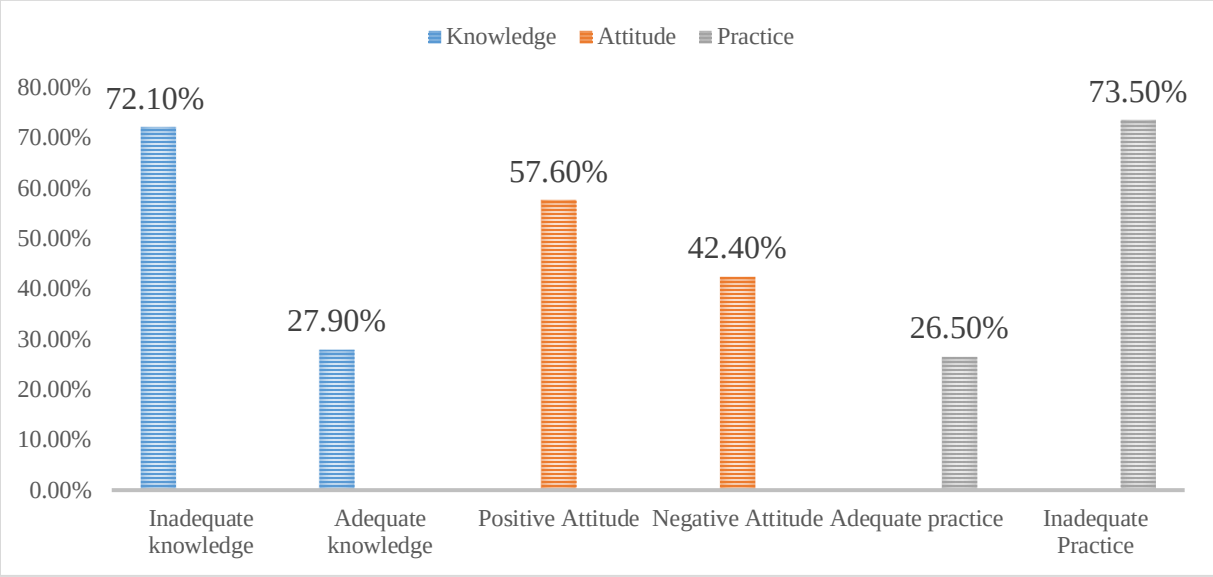

Figure 5.1 Shows the percentage of knowledge, attitude, and practice among undergraduate final-year health science students AAUE, 2025.

5.3 Reported Factors Influence AI Usage

The major barrier to AI usage was a lack of AI knowledge which was 234(57.4%) reported. As reported by participant's challenges affecting AI integration were lack of standardized education 268(65.7%), followed by lack of technical infrastructure 232(56.9%), In additional, Trained persons 215 (52.9%), policies 153 (37.5%) funding 136 (33.3%) and Others challenge responses was 68 (16.9%) no challenges 9 (2.2%). Also, accountability and liability for AI mistakes were the most frequently reported ethical concerns 211 (51.7%), followed by data privacy 199 (48.8%)and biases in fairness 190 (46.6%), and transparency was noted as a challenge by 117

(28.7%) of respondents, while only a small percentage 4(0.5%) other ethical concerns, 16(3.9%) reported no ethical concerns at all. Regarding job displacement, 159 (39.0%) of respondents expressed fear that AI could replace human roles, another factor reported in below table. (Table 5.5).

Table 5.5. Correct and incorrect responses to factors affecting AI usage among undergraduate final-year health science students (n = 408) AAUE, 2025.

Variable		Response	Frequency, N(408)	Percentage (%)
Barriers restrain AI	knowledge	Yes	234	57.4
		No	174	42.6
	Equipment	Yes	218	53.4
		No	190	46.6
	Privacy	Yes	165	17.3
		No	243	59.6
	Integration	yes	182	44.6
		no	226	55.4
	Hands-on-training	yes	134	67.2
		no	274	32.8
	Other**	yes	1	.20
		no	407	99.8
	Nothing	yes	15	3.7
		no	393	96.3
AI trust	Yes		234	57.4
	No		174	42.6
Familiarity	Machine learning	yes	196	48.0
		no	212	52.00
	Medical diagnosis	yes	179	43.9
		no	229	56.1
	Robotics	yes	199	48.8
		no	209	51.2
	Imaging	yes	155	38.0
		no	252	61.8
	Model	yes	141	34.6
		no	267	65.4
	Other**	yes	3	0.7
		no	405	99.3
	Nothing	yes	33	8.1
		no	375	91.9

Other**= Accessibility, Underdevelopment

Nothing=no lack of familiarity/no barriers

5.4 Factors affecting knowledge, attitude, and practical usage of AI

Factor affecting knowledge and attitude: The following factor affecting knowledge and attitudes such as age, gender, location of attend elementary and high school, marital status, current field of study, prior exposure, sources of information to know AI simple binary logistic regression was performed for each independent variable, and those with p-value < 0.25 were entered into multiple logistic regression to control confounding factors. Variables with a p-value < 0.05 in the multivariable analysis were considered as having significant statistical association with the outcome variable.

Accordingly, Pharmacy (AOR = .503, 95% (.236-1.072) p = 0.075) shows lower AI knowledge compared to medicine, but was not statistically significant suggesting limited exposure to AI perspectives in these fields. However, regarding attitudes one indicator variable in the model was a statistically significant predictors of attitude toward AI. Being degree nursing students having less likelihood of having a negative attitude towards AI usage than the reference group by 61.2% (AOR = 0.388, 95% CI: 0.170-0.885, p = 0.024). (Table 5.6).

Table 5.6 Factors associated with knowledge of AI usage among undergraduate final-year health science students of AAUE 2025

variable	**category**	**KNOWLEDGE**		**COR [95% C.I]**	**P- Value**		**AOR [95% C.I]**
		poor	**Good**		**COR**	**AOR**	
Age	21-23	84	37	.789(.346-1.797)	.572	.913	1.054(.407-2.730)
	24-26	177	60	.578(.297-1.126)	.107	.143	.605(.309-1.185)
	>=27	29	17	1.00	1.00	1.00	1.00
Gender	female	255	139	1.326 (.855-2.056)	.208	.178	1.374(.865-2.183)
	male	68	46	1.00			1.00
Department	Medicine	162	67	1.00			1.00
	Pharm	56	14	.604(.315-1.159)	.130	.075	.503(.236-1.072)
	Nursing	20	7	.846(.342-2.095)	.718	.392	.604(.190-1.919)
	Anesth	13	7	1.302(.498-3.407)	.591	.805	.861(.263-2.822)
	Radio	19	8	1.018(.425-2.439)	.968	.546	.736(.271-1.995)
	Lab	16	9	1.360(..573-3.230)	.486	.922	.948(.325-2.765)
	Midwife	8	2	.604(.125-2.921)	.531	.278	.380(.066-2.180)
	ATTITUDES						
	category	**Neg**	**Pos**	**COR [95% C.I]**	**P- Value**		**AOR [95% C.I]**
					COR	**AOR**	
Departme	Medicine	91	138	1.00	1.00	1.00	1.00

variable	category	KNOWLEDGE		COR [95% C.I]	P- Value		AOR [95% C.I]
		poor	Good		COR	AOR	
nt	Pharm	32	38	.783(.457-1.343)	.285	.421	.801(.466-1.376)
	Nursing	17	10	.388(.170-.885)	.024	**.024****	.390(.170-.891)
	Anesth	10	10	.659(.264-1.647)	.373	.356	.649(.259-1.605)
	Radio	9	18	1.319(.568-3.063)	.520	.521	1.319(.567-3.067)
	Lab	9	16	1.172(.497-2.766)	.717	.745	1.153(.488-2.726)
	Midwife	5	5	.659(.186-2.342)	.520	.540	.674(.189-2.399)
knowledge category	Inadequate knowledge	130	164	.762(.490-1.189)	.232	.273	1.286(.820-2.015)
	Adequate knowledge	43	71	1:00			1:00

COR: crude odd ratio of the independent variable and compare age with the highest age, gender with male, all departments with medicine highest number 229, inadequate with adequate knowledge category after mean score done.

AOR (CI): adjusted odd ratio with confidence interval

** P value < 0.05 and variable in bold statistically significantly associated with the outcome variable.

Factor affecting practical: Variables such as the location of elementary and high school attended, departments, lack of familiarity with, challenges, and barriers became candidate variables. However, the final model identified lack of knowledge, and lack of AI equipment significantly associated with our outcome variable. Accordingly, this finding suggests that students who had a lack of knowledge were almost twice as likely to have inadequate AI practice compared to those with adequate knowledge of AI (AOR_1.905 [1.173–3.09], p_.009). Similarly, Students who had limited equipment accessibility barriers were approximately 1.7 times more likely to have lower engagement in AI applications compared to those with adequate access to AI tools (AOR 1.739 [1.066 –2.837], p _ .027). (Table 5.7).

Table 5.7 Factor affecting practical usage of AI among undergraduate final-year health science students AAUE,2025.

Variables	Category		AI practice		COR [95% C.I]	AOR [95% C.I]	P-Value
			Poor	good			
Location	Urban		223	87	1:00	1:00	
	Rural		77	21	.6999(.406-1.202)	.761(.430-1.346)	.347
field	Medicine		162	67	1:00	1:00	
	Pharmacy		55	15	.659(.348-1.248)	.645(.329-1.261)	.200
	Nursing		18	9	1.209(.517-2.827)	1.170(.488-2.808)	.725
	Anesthesia		16	4	.604(.195-1.875)	.696(.217-2.236)	.543
	Radiology		23	4	.421(.140-1.262)	.443(.144-1.363)	.156
	Laboratory		19	6	.764(.292-1.992)	.728(.267-1.984)	.535
	Midwife		7	3	1.036(.260-4.128)	.967(.225-4.151)	.964
Familiarity	Imaging	yes	120	35	1.371(.861-2.184)	1.290(.376-4.430)	.686
		no	180	72	1:00	1:00	
Challenge	Policies	yes	118	35	1.352(.850-2.152)	.956(.274-3.334)	.944
		no	182	73	1:00	1:00	
	No challenge	yes	8	1	1:00	1:00	
		no	292	107	2.932(.362-23.716)	2.434(.271-21.831)	.427
Barriers	Lack of knowledge	yes	181	53	1.578(1.014-2.457)	1.905(1.173-3.09)	**.009***
		no	119	55	1:00	1:00	
	Limited Equipmen	yes	169	59	1.553(.998-2.417)	1.739(1.066-2.837)	**.027****
		no	131	49	1:00	1:00	
	Privacy	yes	114	51	.685(.439-1.068)	.710(.440-1.145)	.160
		no	186	57	1:00	1:00	
	integration	yes	132	50	.911(.586-1.417)	.751(.455-1.240)	.263
		no	168	58	1:00	1:00	
	No barriers	yes	13	2	1:00	1:00	
		no	287	106	2.401(.533-10.816)	2.937(.585-14.743)	.191

COR: crude odd ratio of independent variable and compare age with >27 years, gender with male, all department with medicine highest number 229, dichotomous variable yes had familiarity, challenges, barriers of AI use with no response.

AOR (CI): adjusted odd ratio with confidence interval and value in bold were statistically significantly associated with the dependent variable.

** P value < 0.05, *p< 0.01, P-values < 0.05 were statistically significant.

Other*= departments, a tool to healthcare specific, lack of accessibility.

6 DISCUSSION

This study assessed the knowledge, attitudes, practices, and factors affecting the practical usage of AI among undergraduate final-year health sciences students at Addis Ababa University, Ethiopia. The mean age was (mean ±SD) 24.33 ± 1.864 years**,** with the largest age interval of 24-26 years (58.2%)**.** However, Medicine accounted for the highest department representation, with 229 participants (56.13%). As a result, the overall percentage of inadequate knowledge was 72.1%, while insufficient practice was 73.5%. However, 57.65% of respondents demonstrated positive attitudes towards AI. Also, graduate pharmacy students had an association with knowledge. But statistically not significant (p=.071). However, being undergraduate nursing student had an association with attitudes. While lack of knowledge (p_.009) and limited technical equipment (p_.027) had associations with the practical use of AI.

This study is somewhat similar to a multinational cross-sectional study conducted predominantly on limited AI practices[46], and systematic review(inadequate knowledge 50%, positive attitudes 76%,inadequate practices 67%)[31]. This study was also consistent with the study done in Jordan shows some barriers of AI acceptance was lack of knowledge, access issues, time restraints, and curriculum gaps in medical education[27], Mogadishu inadequate practices of AI(79.1%)[33]. The possible reason for this result being in line with the previous study may be related to the similarities of some determinant socio-demographics and similarities of tools used to assess and similarities of medical curriculum.

This study's findings show that a majority of students had insufficient knowledge and practical experience in using AI. However, despite these challenges, more than half had a positive attitude which was similar to other reports [12,22,33]. In this study, 27.1%% had adequate knowledge of AI. Incontrast to this study done in Saud Arabia, adequate knowledge was 55.7% reported[21]. As study was done at Western Australia on medical students 84.8% had basic understanding [63]. On the other hand, highlights students' awareness of AI applications in radiology, with 242(59.3%) participants indicating knowledge in this area. In contrast, a study conducted in another country found that 79.8% of participants had inadequate knowledge of AI applications in radiology [62].

Other study findings state that 39.26% of participants had adequate knowledge of AI[64]. As a systemic review conducted among healthcare students shows, in six of the studies, students' high knowledge of AI was reported. However, two of the studies reported average student's general

knowledge was just about 50%[31]. In contrast to this study, the study done in Mogadishu, Somalia, and Egypt among nursing students shows 67.6% and 68.2% [33,41] respectively had favorable knowledge about AI. Therefore, what makes differences may be due to the study population, integration of AI into the curriculum, and economic differences.

In this study, the positive attitudes towards AI were 235 (57.6%). According to a study done in India, 87.2% of doctors were interested in learning the practical applications of AI in medical practices[38]. In line with this study, the other study done in Iran shows that, had positive attitudes and other at Egypt among nursing students shows that 67.3% had positive attitudes towards AI[41]**.** Similarly, other study result shows that 80.5%[33],76% of healthcare students had a positive attitude toward AI[31], 73.06% of respondents had positive attitudes toward AI. So, the reason why may be due to this system's important technology [64].Our finding shows add to curriculum interest was strongly agree 106(25.8%), agreed 150 (36.5%).Inline to this other study reported that strongly agree(21.15%) and agree(53%)[12]**.**

In contrast to this, another study done in Saud Arabia shows 37.0% less than half had a positive attitude toward AI[21]. Out of the total respondents, 106(25.8) strongly agree and 150(36.5) agree essential in the medical curriculum. Similar to this, 129(27.4%) individuals strongly agree and 221(47%) agree that AI is essential in health science curricula and guiding AI-focused curricula helps to facilitate students to perform AI-based real healthcare delivery [12].

In this study, findings show, that students had inadequate practice 73.5% of AI in medical education. In contrast to this study**,** a study in India among medical doctor's states that 26 doctors applied AI into their practices 96.25% believed that its application was easy and made an easy task[38], In addition to this, other studies state, that medical students had poor readiness for AI in healthcare [65]. In line with our study result, in Mogadishu, Somalia, 79.1% of respondents reported poor practices with AI[33].Whereas, another study shows 50.3% had good practices toward AI[21]. The possible reason that make differences may be had different medical curriculum and geographical area.

This study revealed that nursing students were 61.2% (P _.024) less likely to have a negative attitude towards AI compared to medicine. However, results show that midwifery and public health professionals were more likely to use AI [33]. In line to our findings, other studies illustrated pharmacy students had positive attitudes toward AI[46]. In contrast with our result, the study

determined administrative doctors had a negative attitude toward AI[62].Possible reasons make differences might be due to different study populations, study areas, knowledge levels varieties,

Also, lack of knowledge was a factor affecting the practical use of AI (p_.009) other comparable study state that lack of knowledge AI at medical education affecting AI application [27]. A study conducted in Sudan stated that the lack of a formal curriculum causes limited knowledge of AI among medical students [22]**.**

Again, the findings of this study show a lack of technical equipment in medical education 1.7 times more likely restrained from AI usage with (p**_.**027) than the student's use of technical equipment in medical education. Similarly, the study stated lack of knowledge and expertise due to lack of AI access/technical equipment among medical sciences students affects AI application[27]**.** Therefore, other the study showed that technical equipment was crucial to using AI for medical science education [5].

6.1 Limitation

This study includes its cross-sectional design, which restricts the ability to establish causal relationships. Additionally, our participant's data was recruited from all departments without proportional allocation being done. However, due to this approach, the departments were not well-defined for participant comparison. For this reason, it may impact on the generalizability of our findings.

7 CONCLUSION AND RECOMMENDATION

Our findings reveal that due to the lack of AI training in medical education, among undergraduate health science a significant portion of students lack adequate knowledge and practical experience in AI. However, more than half of students show a positive attitude toward AI. Statistically significant barriers, particularly limited knowledge of AI and lack of technical equipment hindered AI adoption, with undergraduate nursing students demonstrating the strongest correlation between attitudes and AI commitment. Compared to international medical science students, local participants display lower AI familiarity, indicating a need for further investigation and targeted interventions for them. Therefore, to address these gaps, AI awareness should be expanded through strategic media campaigns and integrated into medical curricula both theoretically and practically, equipping students with the necessary skills to effectively utilize AI in healthcare. Additionally, future research should explore knowledge, attitudes, and AI's practical implementation in medical education, by focusing on overcoming existing challenges to optimize AI adoption and enhance educational outcomes in medical settings.

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QUESTIONNAIRE

7.1 Part I: quantitative part

7.1.1 Annex I: Information sheet and consent form

Consent form to certify the participant's agreement on the Questionnaire

Research Topic: To assess knowledge, attitudes, practices, and factors affecting artificial intelligence usage among final-year undergraduate health science students at Addis Ababa University, Ethiopia, 2025. G.C.

Investigator: Bikila Bekele (MPH)

E-mail: bikila4423@gmail.com Mob**.** +251912242998/920584423

My name is _____, I am working as a data collector on the study about the assessment of knowledge, attitudes, practices, and factors affecting artificial intelligence usage among final-year undergraduate health science students at Addis Ababa University, Ethiopia. An investigator would do a thesis for partial fulfillment of a master's degree in master of emergency medicine and critical care nursing from Addis Ababa University, Ethiopia. It was my pleasure to notify you that you have been identified to participate in this study. I am going to ask you a few questions. Your name would not be written in this form and the information you will give us is kept confidential. If you do not want to answer all or some of the questions, you do have the right to discontinue the interview. However, your willingness to answer all of the questions would be very important to the study. There are no emotional risks anticipated in participating in the interview as the questions are not personal. It doesn't take more than 20 minutes.

Are you willing to continue with the interview? Yes ☐ No ☐

THANK YOU!!

7.1.2 Annex II: consent form

What I get information regarding my participation in this study was clear to me. I had to give a chance to ask questions. I am voluntarily participating in this study. Participants understood that my records would be kept private and that I that leave the study at any time. Participants understand as no problem if not need to interview.

Participant signature _____Date: _____

Yes_____ Continue to the next page

No_____ Skip to the next participant

Signature of interviewer_____

Date of data collection_____/_____/_____

(Agreements and consents were provided to me in written form on our Telegram platform, including a web link, by the principal investigator).

7.1.3 Quantitative questionnaires

The questionnaire obtained from this reference

Socio-demographic characteristics[45, 46, 61, 65]

S.No.	Items	response
101	How old are you?	___years
102	What gender do you identify as?	A. Male B. Female
103	Where did you attend elementary and high school?	A. Rural B. Urban
104	What's your marital status?	A. Single B. Married C. Divorced D. Widowed E. Separated
105	What's your current field of study?	A. Medicine B. Pharmacy C. Nursing D. Anesthesia E. Radiology F. Laboratory G. Midwifery
106	Do you have any prior exposure working with AI technology in healthcare settings? (You can choose two or more)	A. Yes, during clinical practice B. Yes, on academic projects C. Other (If other specify it.....) D. No prior exposure
107	What are your sources of information to know AI? (You can choose two or more)	A. Curriculum B. Internet/Social media C. Other (If other specify it.....) D. Nothing information

Knowledge of artificial intelligence(AI) [27, 31, 45, 61].

	Items	Yes	No
108	Do you know what artificial intelligence is?		
109	Do you know about any application of AI in health science?		
1010	Do you know about deep learning/machine learning (subtypes of AI)?		
1011	Have you ever been taught about AI technology in your curriculum?		
1012	Do you understand barriers to the application of AI in health sciences?		
1013	Have you ever received training/courses on AI technologies in your field of study?		
1014	Are you aware of any AI applications in radiology?		
1015	Are you aware of any AI applications in pathology?		
1016	Do you agree with AI-assisted emergency responses?		
1017	Have you ever heard of AI applications for diagnosing diseases?		

Attitude regarding AI items[21, 22, 25, 31, 61.

	Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1018	I believe AI is essential in the medical field of study/ health science curriculum.					
1019	I believe the ethical consequences of AI must be understood by different students.					
1020	I believe that AI will revolutionize the educational system.					
1021	I believe that clinical AI will be more accurate than healthcare professionals.					
1022	I think the benefits of AI compensate for risks in healthcare.					
1023	I believe that in the future AI could replace healthcare professionals**.**					
1024	I think AI aids practitioners in early diagnosis and assessing the severity of the disease.					
1025	I believe AI would increase the percentage of errors during diagnosis and care.					
1026	I believe that the use of AI reduces the workload of healthcare students.					
1027	I think that health science students should receive training on the use of AI tools.					

Practices towards AI [12, 22, 25, 31, 33, 61, 66].

	Items	Yes	No
1028	Have you frequently applied AI technology in your field of study?		
1029	Have you ever used AI frequently to conduct your exams?		
1030	Do you plan to use AI regularly for conducting your research?		
1031	Do you plan to work on AI in your future program?		
1032	Have you attended any previous online/offline courses regarding AI?		
1033	Has AI integrated into clinical practice during your clinical attachments?		
1034	Was it easy for you to apply AI?		
1035	Did AI use to make your task easy?		

Factor affecting the use of AI [5, 27, 51, 55, 59, 67].

1036	Which AI technologies do you have lack of knowledge or are unfamiliar with? (You can choose	A. Machine learning (deep Learning, Neural networks) systems B. AI in medical diagnostics and treatment planning

	two or more)	C. Robotics/automation in the medical area D. AI in medical imaging (e.g. radiology) E. Data analytics and predictive modeling system in health sciences F. Other (If the other specifies it.....) G. No lack of knowledge
1037	lack of trust in AI technologies makes health science students resistant to adopting AI tools in healthcare settings?	A. Yes B. No
1038	Do you fear AI will lead to job displacement for healthcare professionals in the future?	A. Yes, I fear job displacement B. No, I do not fear job displacement C. I am not sure
1039	What ethical consideration (issue) do you believe is most important when integrating AI in healthcare? (you can choose more than two or more)	A. Patient data privacy and security B. Equity in AI decision-making C. Accountability and liability for AI mistakes D. Transparency and explain-ability of AI systems E. Other (If other specifies it.....) F. No ethical consideration(issue) needed
1040	What are the challenges affecting AI integration into the healthcare system? (You can choose two or more)	A. Lack of technical infrastructure B. Lack of trained personnel C. Lack of standardized education (lacks a clear framework) D. Lack of regulatory policies E. Lack of funding F. Other (If other specifies it.....) G. No challenges
1041	Which of the following barriers restrain you from using Artificial Intelligence in medical practices and education? (You can choose two or more)	A. Lack of knowledge B. Limited access to technical equipment C. Privacy concerns D. Limited integration in educational curricula E. Lack of hands-on-training (advanced skill) F. Other (If the other specifies it.....) G. No barriers

Thank you very much for your time!!